

IN THE CLAIMS

Claims 1-109 (Cancelled)

110. (Previously Presented) A system for storing data comprising:

- an interface configured to receive a plurality of data changes, the data changes indicating a change in data stored on a storage volume of a host;
- a meta-data block generator configured to generate a plurality of meta-data blocks, each meta-data block associated with at least one of the data changes, the meta-data blocks indicating a time that data changes associated with the meta-data blocks were made on the storage volume relative to other data changes; and
- a local buffer configured to store the data changes and the meta-data blocks.

111. (Previously Presented) The system of claim 110, wherein each meta-data block includes at least one of a timestamp associated with the associated data changes, and a sequence number associated with the associated data changes.

112. (Previously Presented) The system of claim 110, wherein each meta-data block includes a timestamp associated with the associated data changes, and a sequence number associated with the associated data changes.

113. (Previously Presented) The system of claim 110, further comprising:

- a communications link coupled to the local buffer;
- a communications link monitor configured to monitor a status of the communications link; and
- a remote buffer coupled to the communications link and configured to receive and store the data changes and the associated meta-data blocks from the local buffer;

wherein the local buffer is configured to pause transmission of the data changes and associated meta-data blocks if the communications link monitor detects an interruption of the communications link.

114. (Previously Presented) The system of claim 113, wherein the local buffer is further configured to resume transmission of the data changes and associated meta-data blocks if the communications link monitor detects that the communications link is restored.

115. (Previously Presented) The system of claim 110, further comprising:
a communications link coupled to the local buffer;
a communications link monitor configured to monitor a status of the communications link; and

a remote buffer coupled to the communications link and configured to receive and store the data changes and the associated meta-data blocks from the local buffer;

wherein the local buffer is configured to adjust a rate of transmission of the data changes and associated meta-data blocks in response to the communications link monitor detecting a change in available bandwidth.

116. (Previously Presented) The system of claim 110, further comprising:
a communications link coupled to the local buffer;
a remote buffer coupled to the communications link and configured to receive and store the data changes and the associated meta-data blocks from the local buffer; and
a remote mirror including all of the data stored on the storage volume at a current point in time; and

a snapshot, wherein the snapshot includes all data of the storage volume at an associated point in time;

wherein the remote buffer is configured to independently update the snapshot and the remote mirror using the data changes.

117. Previously Presented) The system of claim 116, wherein the remote buffer is configured to store in the snapshot an oldest data change of the data changes stored in the remote buffer according to the associated meta-data blocks and remove the oldest data change from the remote buffer.

118. (Previously Presented) The system of claim 116, further comprising:

a volume reconstructor configured to generate data of the storage volume from a previous point in time from the snapshot, and at least one of the data changes and the meta-data blocks associated with the at least one data change.

119. (Previously Presented) The system of claim 110, further comprising:
a communications link coupled to the local buffer; and
a remote buffer coupled to the communications link and configured to receive and store the data changes and the associated meta-data blocks from the local buffer;
wherein the local buffer is configured to maintain a particular data change in the local buffer until after an acknowledgement indicating that the particular data change was stored in the remote buffer is received by the local buffer.

120. (Previously Presented) The system of claim 119, further comprising:
a local mirror configured to store the data changes and including all of the data stored on the storage volume at a point in time;
wherein the interface is further configured to transmit the data changes to the local buffer and the local mirror.

121. (Previously Presented) The system of claim 110, further comprising:
a communications link coupled to the local buffer;
a remote buffer coupled to the communications link and configured to receive and store the data changes and the associated meta-data blocks from the local buffer; and
a remote mirror including all of the data stored on the storage volume at a point in time;
wherein the local buffer is configured to maintain a particular data change in the local buffer until after an acknowledgement indicating that the particular data change was stored in the remote mirror is received by the local buffer.

122. (Previously Presented) The system of claim 120, wherein the local buffer is configured to remove the particular data change from the local buffer when the acknowledgement indicating that the particular data change was stored in the remote mirror is received by the local buffer.

123. (Previously Presented) The system of claim 120, wherein the local buffer is configured to remove the particular data change from the local buffer when a signature associated with the particular data change and received by the local buffer is validated.

124. (Previously Presented) The system of claim 123, wherein the signature is a checksum.

125. (Previously Presented) The system of claim 110, further comprising:
a communications link coupled to the local buffer;
a remote buffer coupled to the communications link and configured to receive and store the data changes and the associated meta-data blocks from the local buffer; and
a remote mirror including all of the data stored on the storage volume at a point in time;
wherein the remote buffer is configured to store the data changes in the remote mirror in an order indicated by the associated meta-data blocks.

126. (Currently Amended) A The system of claim 110 for mirroring data, further comprising:

a plurality of hosts, each host including a primary storage volume;
a plurality of first mirroring units, each mirroring unit coupled to an associated host and configured to mirror the primary storage volume of the associated host, such that each host is coupled its own first mirroring unit; and
a second mirroring unit coupled to the first mirroring units, the second mirroring unit configured to mirror the mirrored primary storage volumes of the first mirroring units;

wherein:

a first mirroring unit of the plurality of first mirroring units includes the interface, the meta-data block generator, and the local buffer, where the first mirroring unit is coupled to its corresponding host through the interface.

127. (Previously Presented) The system of claim 126, wherein the second mirroring unit locks access to a mirror of a mirrored primary storage volume in response to an access by an associated first mirroring unit.

128. (Previously Presented) The system of claim 126, wherein the second mirroring unit is further configured to provide a secondary host with access to a mirror of a mirrored primary storage volume through a network-based data window.

129. (Previously Presented) The system of claim 128, wherein the network-based data window includes a browser plugin.

130. (Previously Presented) The system of claim 110, wherein:
the storage volume is divided into a plurality of blocks; and
each data change indicates at least one of the blocks of the storage volume with the data that was changed in the storage volume.

131. (Previously Presented) The system of claim 130, further comprising:
a communications link coupled to the local buffer;
a remote mirror divided into a plurality of blocks, the blocks of the remote mirror corresponding to the blocks of the storage volume on a one-to-one basis; and
a remote buffer coupled to the communications link and configured to receive and store the data changes and the associated meta-data blocks from the local buffer and configured to store the data changes in the corresponding blocks of the remote mirror.

132. (Previously Presented) The system of claim 130, further comprising:
a local mirror divided into a plurality of blocks;
wherein the local buffer is configured to store a particular data change and associated meta-data block only if data in a block of the local mirror that corresponds to a block associated with the data change is different from corresponding data in the data change.

133. (Previously Presented) The system of claim 110, wherein:

the interface is a standard storage subsystem bus interface; and
the data changes are write requests received through the standard storage subsystem bus interface.

134. (Previously Presented) The system of claim 133, further comprising:
a local mirror coupled to the interface through a second standard storage subsystem bus interface;
a communications link coupled to the local buffer;
a remote buffer coupled to the communications link and configured to receive and store the data changes and the associated meta-data blocks from the local buffer;
wherein the interface is configured to provide a first copy of the write request to the local mirror through the second standard storage subsystem bus interface and to provide a second copy of the write request to the local buffer.